

CLAIMS

We claim:

1. A method of geophysical exploration of a subsurface region of interest, comprising:
utilizing an unsupervised learning network to organize seismic data representing a subsurface region of interest;
correlating a portion of said organized seismic data with lithological data from a well bore located in said subsurface region of interest; and
applying said correlation to said seismic data to estimate lithology in said subsurface region of interest.
2. The method of claim 1 wherein said unsupervised learning network is a self organizing feature map.
3. The method of claim 1 wherein said unsupervised learning network is a Kohonen network.
4. A method of geophysical exploration of a subsurface region of interest, comprising:
applying a plurality of seismic data attributes for measurement location from a seismic data set from a subsurface region of interest to a Kohonen network to organize said seismic data set into a plurality of seismic Kohonen classes;
selecting a subset of said organized seismic data set representative of the earth's subsurface in the vicinity of a well bore penetrating said subsurface region of interest;
correlating Kohonen classes of said subset of said organized seismic data set with classes of lithological data from said well bore to generate a correlation between Kohonen classes and lithological classes; and
applying said correlation to said seismic data set to estimate lithology of said measurement locations.

1 5 The method of claim 4 wherein said seismic data attributes comprise semblance,
2 amplitude-versus-offset and attenuation.

1 6. The method of claim 4 wherein said lithological data comprise volume shale and
2 acoustic impedance.

7. A method of geophysical exploration of a subsurface region of interest, comprising:

- applying a plurality of lithology values for measurement location from a well bore penetrating a subsurface region of interest to a Kohonen neural network to organize said lithology values into a plurality of lithology Kohonen classes;
- utilizing said lithology Kohonen classes to establish ranges of a lithology value;
- applying a plurality of seismic data attributes for measurement location from a seismic data set from said subsurface region of interest to a Kohonen network to organize said seismic data set into a plurality of seismic Kohonen classes;
- selecting a subset of said organized seismic data set representative of the earth's surface in the vicinity of said well bore penetrating said subsurface region of interest;
- correlating Kohonen classes of said subset of said organized seismic data set with classes of lithological data from said well bore to generate a correlation between Kohonen classes and lithological classes, wherein said ranges of a lithology value are utilized in establishing boundaries of said lithology classes; and
- applying said correlation to said seismic data set to estimate lithology of said measurement locations from said subsurface region of interest.

1 8. The method of claim 7 wherein said lithology values are volume shale and acoustic
2 impedance.

1 9 The method of claim 7 wherein said seismic data attributes comprise semblance,
2 amplitude-versus-offset and attenuation.

1 10. A device which is readable by a digital computer having instructions defining the
2 following process and instructions to the computer to perform said process:
3 utilizing an unsupervised learning network to organize seismic data representing a
4 subsurface region of interest;
5 correlating a portion of said organized seismic data with lithological data from a
6 well bore located in said subsurface region of interest; and
7 applying said correlation to said seismic data to estimate lithology in said subsurface
8 region of interest.

1 11. A device which is readable by a digital computer having instructions defining the
2 following process and instructions to the computer to perform said process:
3 applying a plurality of seismic data attributes for measurement location from a
4 seismic data set from a subsurface region of interest to a Kohonen network to organize said
5 seismic data set into a plurality of seismic Kohonen classes;
6 selecting a subset of said organized seismic data set representative of the earth's
7 subsurface in the vicinity of a well bore penetrating said subsurface region of interest;
8 correlating Kohonen classes of said subset of said organized seismic data set with
9 classes of lithological data from said well bore to generate a correlation between Kohonen
10 classes and lithological classes; and
11 applying said correlation to said seismic data set to estimate lithology of said
12 measurement locations.

1 12. A device which is readable by a digital computer having instructions defining the
2 following process and instructions to the computer to perform said process:
3 applying a plurality of lithology values for measurement location from a well bore
4 penetrating a subsurface region of interest to a Kohonen neural network to organize said
5 lithology values into a plurality of lithology Kohonen classes;
6 utilizing said lithology Kohonen classes to establish ranges of a lithology value;

